2023
IFT
EFFoST

INTERNATIONAL NONTHERMAL PROCESSING

WORKSHOP & SHORT COURSE

October 15-17, 2023

GRADUATE HOTEL
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MN

Hosted by
Center For Biorefining
Department of
Bioproducts and
Biosystems Engineering
University of Minnesota

Foreword

With great pleasure, we extend our warm welcome to the 2023 IFT-EFFoST International Nonthermal Processing Workshop and Short Course, set to unfold from October 15 to 17, 2023, in Minneapolis, Minnesota, USA.

This event promises to be a dynamic convergence of global experts in the field, uniting to explore the very latest advancements, innovations, and the pressing challenges surrounding nonthermal processing.
At the heart of our workshop and short course lies a central theme: the application of sustainable circular economy concepts through innovative nonthermal processing technologies. These forward-thinking approaches have the transformative power to reshape the food industry by addressing critical concerns such as resource conservation (energy and water), waste reduction, enhanced food safety, health preservation, and the realization of sustainable development goals.

In the face of profound global challenges - ranging from food safety and resource depletion to climate change and food waste—the significance of nonthermal processing technologies cannot be overstated. It is disheartening to acknowledge that one-third of the world's food is lost or wasted annually, resulting in the squandering of resources valued at a staggering $1 trillion. Together, it is our shared responsibility to confront these issues and work towards a more sustainable, circular economy approach.

We are thrilled that our event has garnered substantial participation from industry professionals. Their active involvement underscores the practical relevance of the topics we will be exploring and the real-world implications of nonthermal processing technologies. The industry's strong presence serves as a resounding testament to the immediate applicability of the knowledge we aim to impart during the workshop.

Beyond the academic program, this conference is designed to foster networking and collaboration. It is an opportunity for you to connect with colleagues from around the world, establish new relationships, and explore potential collaborations that can drive innovation in the field.

An international workshop of this magnitude is not possible without financial support. We are grateful for USDA NIFA conference grant 2023-67017-40776. We also thank IFT for a Division Program Grant, and our industry sponsors (thyssenkrupp, Hiperbaric, and Elsevier) for their generous funding support. We also thank the leadership and executive committee of IFT Nonthermal Processing Division as well as EFFoST for their constructive suggestions and feedback. Finally, we thank all the members and volunteers of IFT-EFFoST International Scientific committee for volunteering their time for developing this program as well as their effort in judging various student posters.

We encourage you to take full advantage of all that the workshop has to offer. Attend the sessions that pique your interest, participate in the discussions, and connect with your colleagues. We hope that you will leave the workshop inspired and equipped to make a positive impact on the future of food processing.

Yours sincerely,

Organizing Committee
Roger Ruan (Co-chair), Kumar Mallikarjunan (Co-chair)
VM Balasubramaniam (Program Chair), and Paul Chen (Executive Coordinator)

International Scientific Committee

Name	Institution
V.M. Balasubramaniam	The Ohio State University IFT-EFFoST workshop committee chairperson
Roger Ruan	University of Minnesota, Chair of IFT-FED (2022-2023)
Kumar Mallikarjunan	University of Minnesota
Paul Chen	University of Minnesota
Gustavo V Barbosa-Cánovas	Washington State University
Carmen I. Moraru	Cornell University Member of IFT-EFFoST Workshop Committee
Christopher Doona	US Army Natick Soldier Systems Center
Indrawati Oey	Otago University
James Lyng	University College Dublin Host of 2022 IFT-EFFoST Workshop held in Ireland
Marleny D.A. Saldaña	University of Alberta
Avi Shpigelman	Technion Israel Institute of Technology
Tatiana Koutchma	Guelph Food Research and Development Center
Fanbin Kong	University of Georgia
Olga Martín Belloso	University of Lleida
Lilia Ahrné	University of Copenhagen
Oliver Schluter	Leibniz Institute for Agricultural Engineering and Bioeconomy
Gianpiero Pataro	University of Salerno
Siming You	University of Glasgow
Jonathan Wong	Hong Kong Baptist University
Samir Kumar Khanal	University of Hawaii at Manoa
Guangwei Huang	Almond Board of California
Yanling Cheng	Beijing Union University
Ruihong Zhang	University of California
Hao Feng	North Carolina A&T State University

Acknowledgements

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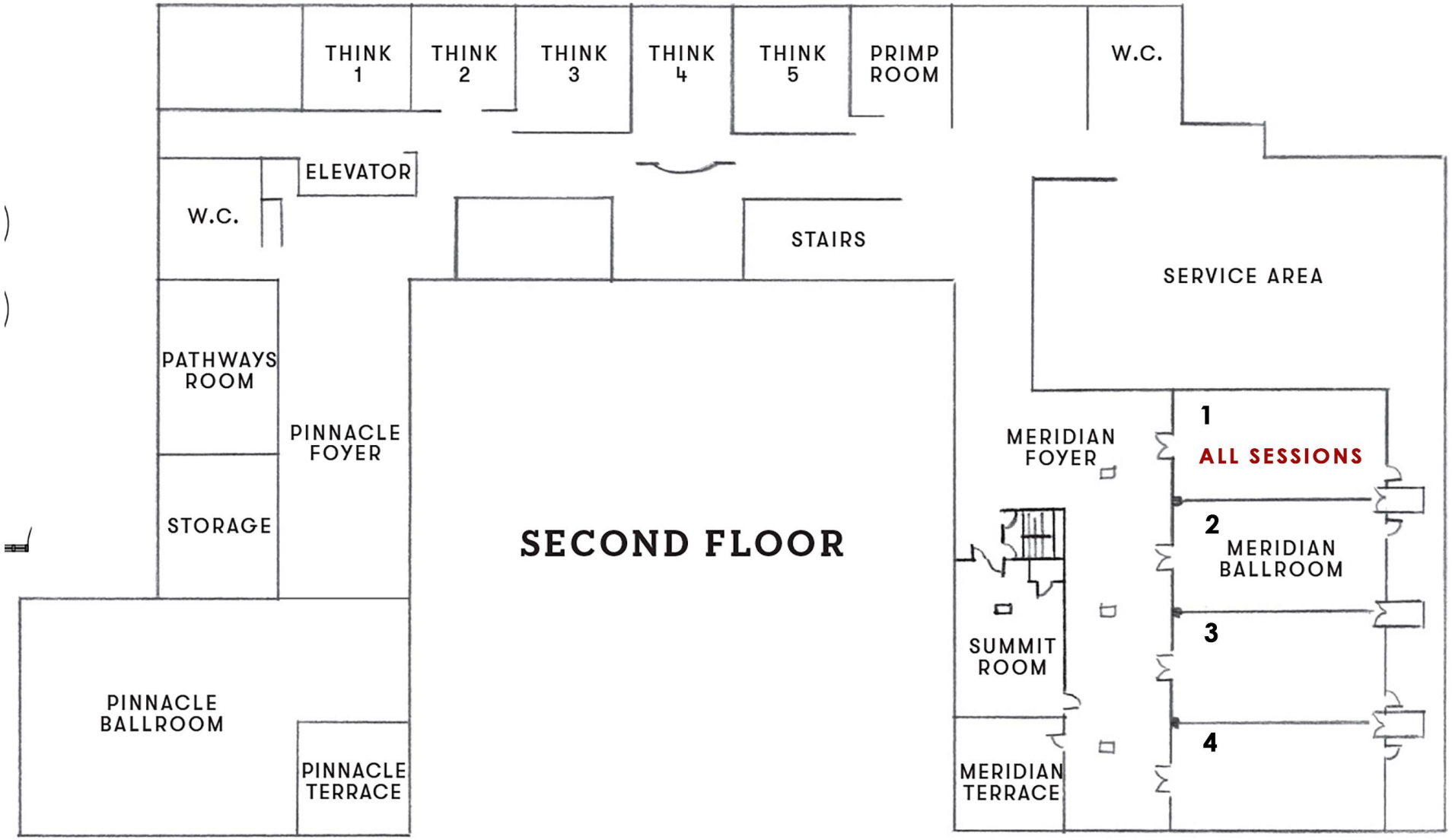
2023 2023 IFT-EFFoST International Nonthermal Processing Workshop & Short Course

Program Schedule At-A-Glance

All conference sessions and functions are conducted on the second floor of the Graduate Hotel.

TIME/ DATE	SUNDAY (October 15)	MONDAY (October 16)	TUESDAY (October 17)
7:30AM	Registration (Think 3 Room)	Registration (Top of Escalators)	Registration (Top of Escalators)
7:30AM	Breakfast (Think 3 Room)	Breakfast (Meridian Foyer & Summit)	Breakfast (Meridian Foyer & Summit)
9:15AM	Short course students to meet in the hotel lobby	- Welcome - Introduction - Session 1: Session 1 - Nonthermal Food and Bioprocessing for Circular Economy Room: Meridian Ballroom 12	Session 5 – Sustainable Nonthermal Food Processing Room: Meridian Ballroom 12
10:00AM	**10:00 AM -6:00** PM **Pre-workshop Short Course** Room 15, Food Science & Nutrition Dept., UMN St. Paul Campus, 1334 Eckles Ave., St. Paul, MN 55108		
10:10AM		Coffee break (Meridian Foyer & Summit)	Coffee break (Meridian Foyer & Summit)
10:25AM-12:05PM		Session 2 – Innovations in Food Safety through Nonthermal Processing Technologies Room: Meridian Ballroom 12	Session 6 - Industry Perspectives on the Future of Food: Implementing Nonthermal Processing Technologies in Industrial Practice Room: Meridian Ballroom 12
12:05		Lunch break (Meridian Foyer & Summit)	Lunch break (Meridian Foyer & Summit)
1:00PM-2:10PM		Posters (Meridian Foyer & Summit)	Virtual session (TBA)
2:00PM-3:40PM		Session 3 - Enhancing Nutrition, Quality, and Health through Nonthermal Processing Room: Meridian Ballroom 12	
3:40PM		Coffee break (Meridian Foyer & Summit)	
3:55PM–5:25PM		Session 4 - Nonthermal Process Development and Validation Room: Meridian Ballroom 12	
5:35PM–6:15PM		Breakout session Room: Meridian Ballroom 12	
6:15PM- 9:30PM		Social Hour 6:00-7:00PM (Meridian Foyer & Summit) BANQUET 7:00- 9:00PM (Meridian Ballroom 34)	

Second floor map, Graduate Hotel Minneapolis



Program Schedule

Sunday, October 15, 2023

7:30 – 8:00		Registration (Think 3 Room)
7:30 – 8:30		Breakfast (Think 3 Room)
9:15		Meet in the hotel lobby

Short course

10:00 am – 5:00 pm, Department of Food Science and Nutrition, St. Paul Campus, University of Minnesota

Chair: Kumar Mallikarjunan

09:55 – 10:00	0	Introduction, *Kumar Mallikarjunan, University of Minnesota, USA*
10:00 – 10:30	1	Principles and application of continuous and pulsed light technologies, *by Tatiana Koutchma, Agriculture and Agri-Food Canada, Canada*
10:30 – 11:00	2	Ozone use for decontamination of food, water, and processing environment, *by Ahmed Yousef, The Ohio State University, USA*
11:00 – 11:15	3	*Coffee break and networking*
11:15 – 11:45		High pressure based food pasteurization and sterilization technologies, *by VM Balasubramaniam, The Ohio State University, USA*
11:45 – 12:15	4	Cold plasma technologies to enhance food safety, *by Brendan Niemira, USDA ARS, USA*
12: 15 – 13:00		Lunch
13:00 – 14:00		Lab tours
14:00 – 14:30	5	Pulsed electric field processing, *by Kumar Mallikarjunan, University of Minnesota, USA*
14:30 – 15:00	6	Tapping into the power of acoustic energy as a food processing modality, *by Hao Feng, North Carolina A&T State University, USA*
15:00 – 15:15		*Coffee break and networking*
15:15 – 15:45	8	Opportunities for Cold-Preservation of Liquid Foods using Filtration, *by Dennis Heldman, The Ohio State University, USA*
15:45 – 16:15	9	Intense Pulsed Light and Low Temperature Microwave Technologies for Food Safety Assurance and Quality Improvement, *by Roger Ruan, University of Minnesota, USA*
16:15 – 17:00		Questions and discussion

Monday, October 16, 2023

7:30 – 8:00		Registration (Top of Escalators)
7:30 – 8:15		Breakfast (Meridian Foyer & Summit)

Workshop

Oral presentations: 8:15 am – 6:00 pm, Meridian Ballroom 12
Poster presentations: 8:00 am – 6:00 pm, Meridian Foyer & Summit

8:15 – 8:25		**Welcome – Workshop Co-Chairs Roger Ruan and Kumar Mallikarjunan** **Welcome – UMN Bioproducts and Biosystems Engineering Department Head, Hua Zhao**
8:25 – 8:30		**Welcome & introduction - Nonthermal processing division, V.M. Balasubramaniam, The Ohio State University, IFT-EFFoST workshop committee chair**
		Session 1 - Nonthermal Food and Bioprocessing for Circular Economy **Chair: Roger Ruan**
8:30 – 8:55	1	Nonthermal Technologies for Gas, Liquid and Solid Wastes Utilization for Sustainable Animal and Food Production and Circular Economy Development, *by Roger Ruan, University of Minnesota, USA*
8:55 – 9:20	2	Green extraction technologies, *by Kumar Mallikarjunan, University of Minnesota, USA*
9:20 – 9:45	3	Life cycle assessment and machine learning-based modelling of food waste treatment, *by Siming You, University of Glasgow, UK*
9:45 – 10:10	4	Achieving high concentrations without heat or pressure with Porifera's forward osmosis technology, *by Jennifer Klare, Porifera Inc., USA*
10:10 – 10:25		Coffee break (Meridian Foyer & Summit)
		Session 2 – Innovations in Food Safety through Nonthermal Processing Technologies **Chair: Xuetong Fan**
10:25 – 10:50	1	Application of nonthermal technologies for produce safety, *by Xuetong Fan, USDA ARS, USA*
10:50 – 11:15	2	Effects of pressure, shear, temperature, and their interaction on the inactivation of Clostridium sporogenes PA3679 spores during ultra-shear processing, *by Hetian Hu, The Ohio State University, USA*
11:15 – 11:40	3	Ultraviolet Light Technology for Microbial and Viral Control in Food Applications, *by Tatiana Koutchma, Agriculture and Agri-Food Canada, Canada*
11:40 – 12:05	4	Innovations in pulsed light technology for pasteurization of beverages, *by Anubhav Pratap-Singh, University of British Columbia, Canada*
12:05 – 13:00		Lunch (Meridian Foyer & Summit)

13:00 – 14:00		**Poster Session viewing and evaluation** **Co-Chairs: Hao Feng and Kumar Mallikarjunan**
		Session 3 - Enhancing Nutrition, Quality, and Health through Nonthermal Processing **Chair: Carmen Moraru**
14:00 – 14:25	1	Cold microfiltration: an alternative nonthermal pasteurization method for fluid foods and beverages, *by Carmen Moraru, Cornell University, USA*
14:25 – 14:50	2	Supercritical CO2 Technology for the Production of Cellulose Nanofiber Aerogels, *by Zhengjie Liu, University of Alberta, Canada*
14:50 – 15:15	3	Synergistic Effect of Sequential Treatment with 222 Nm, 280 Nm, and 405 Nm Light Wavelengths on Inactivation of Foodborne Pathogens, *by Hanyu Chen, Cornell University, USA*
15:15 – 15:40	4	Enhancing Produce Safety with Novel In-Package Surface Dielectric Barrier Discharge Cold Plasma Technology, *by Deepti Salvi, North Carolina State University, USA*
15:40 – 15:55		Coffee break (Meridian Foyer & Summit)
		Session 4 - Nonthermal Process Development and Validation **Chair: Rick Falkenberg**
15:55 – 16:20	1	Head-to-Head: Comparing Air and Surface Disinfection Systems, *by Rick Falkenberg, Scientific Air Solutions, USA*
16:20 – 16:45	2	Modeling of Pulsed Electric Field Processing, *by Sudhir Sastry, The Ohio State University, US*
16:45 – 17:10	3	Hyperbaric storage – from a quasi-energetically costless food storage process to a simultaneously moderate pasteurization method at room temperature? *by Jorge Saraiva, University of Aveiro, Portugal*
17:10 – 17:35	4	AI-assisted process design and optimization in ultrasound applications, *by Hao Feng, North Carolina A&T State University, USA*
17:35 – 18:15		**Breakout session (Roger Ruan (co-chair), VM Balasubramaniam (co-chair), Gustavo Barbosa Canavas, Siming You)** Scientific advances and innovations in nonthermal processing for sustainable circular economy development and workforce
18:15 – 19:00		Reception (cash bar, appetizers provided, Meridian Foyer & Summit)
19:00 – 21:00		Banquet and Award Ceremony (Meridian Ballroom 34)

Tuesday, October 17, 2023

7:30 – 8:00	Registration (Top of Escalators)
7:30 – 8:15	Breakfast (Meridian Foyer & Summit)

Workshop

Oral presentations: 8:20 am – 6:00 pm, Meridian Ballroom 12
Poster presentations: 8:00 am – 6:00 pm, Meridian Foyer & Summit

Session 5 – Sustainable Nonthermal Food Processing
Chair: Norman Scott

8:20 – 8:45	1	Sustainable food production systems, *by Norman Scott, Cornell University, USA*
8:45 – 9:10	2	Driving sustainability of food production with high-pressure processing, *by Jasna Ivanovic, Uhde High Pressure Technologies GmbH, Germany*
9:10 – 9:35	3	Conversion of Almond Hulls to Value-added and Upcycled Food Ingredients, *by Guangwei Huang, Almond Board of California, USA*
9:35 – 10:00	4	Nonthermal Processing and Sustainability, *by Dennis Heldman, The Ohio State University, USA*
10:00 – 10:25		**Coffee break**

Session 6 - Industry Perspectives on the Future of Food: Implementing Nonthermal Processing Technologies in Industrial Practice
Chair: Marcia Walker

10:25 – 10:50	1	Path to Commercializing Innovative Foods using HPP, *by Marcia Walker, Oregon State University, USA*
10:50 – 11:15	2	Challenges and Innovations in High Pressure Processing Commercial Implementation, *by Mario Gonzalez, Hiperbaric, S.A., Spain*
11:15 – 11:40	3	UltraShear Nanoemulsions as Functional Ingredients for the Food Industry, *by Alexander Lazarev, Pressure BioSciences, Inc., USA*
11:40 – 12:05	4	Pulsed Electric field Technology (PEF) and its role in non-thermal Processing – The advantages, the opportunities, the key considerations, and the watchouts, *by Brian Meyer, Food Physics, USA*
12:05 – 12:10		**Introducing 2024 nonthermal workshop (EFFoST speaker)**
12:10		**Concluding remarks Carmen Moraru, Cornell (NPD-EFFoST workshop chair-elect)**

Virtual Session (Chair: Paul Chen)

14:00 – 14:25	1	The impact of nonthermal processing on the bioaccessibility of health-promoting compounds, *by Avi Shpigelman, Technion - Israel Institute of Technology, Israel*
14:25 – 14:50	2	From processing to product: utilizing high-pressure homogenization for producing fermented plant-based yogurt alternative, *by Rachel Levy, Technion-Israel Institute of Technology, Israel*
14:50 – 15:15	3	Potential Benefits of Monitoring Perishable Non-Thermally Preserved Foods Quality through their Package's Quick Response (QR) Code, *by Sam Saguy, The Hebrew University of Jerusalem, Israel*
15:15 – 15:40	4	Engineering future agri-food systems: Selected examples, *by Oliver Schluter, University of Bologna, Italy*
15:40 – 16:05	5	Innovative Non-Thermal Technologies for Recovery and Valorization of Value-Added Products, *by Manuel Salgado-Ramos, University of Valencia, Spain*
16:05 – 16:30	6	Supercritical CO2 Processing: Extraction, Enzymatic Reaction and Drying, *by Marleny Saldana, University of Alberta, Canada*
16:30 – 16:55	7	Emerging Source of Healthy Food for Sustainable Environment - Microbial Biotechnology Approaches for Conversion of Fruit Processing Waste in to Emerging Source of Healthy Food for Sustainable Environment, *by Mukesh Awasthi, Northwest A&F university, China*

Poster Session Oct 16-17

Chair: Hao Feng and Kuma Mallikarjunan

1. Addition of lutein in minimally processed fruit salads by vacuum impregnation, *by Zhengjie Liu, University of Alberta, Canada*
2. Inactivation of Clostridium sporogenes PA 3679 by a synergistic pressure, temperature, and antimicrobial compound combinations, *by Liz Astorga-Oquendo, The Ohio State University, USA*
3. Valorization of discarded carrots into value-added and fiber-fortified smoothies by using high-pressure processing, *by Jasna Ivanovic, Uhde High Pressure Technologies GmbH, Germany*
4. Application of Pulsed Electric Fields for energy efficient processing in the peach industry, *by Petros Taoukis, National Technical University of Athens, Greece*
5. Mathematical modeling of protein extraction from Chlorella pyrenoidosa: The effect of high pressure homogenization pretreatment, *by Petros Taoukis, National Technical University of Athens, Greece*
6. Recovery of bioactive compounds from plant and animal origin by-products: the effect of High Pressure and Pulsed Electric Fields processing, *by Petros Taoukis, National Technical University of Athens, Greece*
7. High pressure processing, a promising technology to enhance protein extraction, *by Silvia de Lamo Castellvi, The Ohio State University, USA*
8. Pecan halves subjected to pulsed UV light: Microbial safety and quality, *by Ajit K. Mahapatra, Fort Valley State University, USA*
9. Extraction of Anthocyanins from Amazon Matrices Using Ultrasound and Natural Deep Eutectic Solvents (NADES), *by Miguel Franco Londoño, University of Alberta, Canada*
10. Inactivation of Airborne Poultry Viruses by Non-thermal plasma and Microwave –assisted Treatment Processes, by Juer Liu, University of Minnesota, USA

11. Conversion of almond hulls to functional ingredients for clean label foods and nutraceutical products, *by Juer Liu, University of Minnesota, USA*
12. High Intensity Ultrasound Extraction of Anthocyanins and Total Phenolics from Cranberry Pomace using Natural Deep Eutectic Solvents, *by Miguel Franco Londoño, University of Alberta, Canada*
13. Investigation the Interaction of electric fields with the key components of spores of Bacillus subtills during Ohmic heating, *by Shyam Singh, The Ohio State University, USA*
14. Lentil protein and pectin gels loaded with β-carotene: Understanding the effect of ultrasonic ethanolic gelation and supercritical CO2 drying, *by Srujana Mekala, University of Alberta, Canada*
15. In Vitro resistance of free and microencapsulated Lactiplantibacillus plantarum by complex coacervation, *by Srujana Mekala, University of Alberta, Canada*
16. Effect of non-thermal processing on physicochemical and immunochemical properties of seafood proteins, *by Qinchun Rao, Florida State University, USA*
17. Continuous high-capacity particulate foods pasteurization system and process, by Dongjie Chen, University of Minnesota, USDA
18. A novel edible coating based on UV-C treated gallic acid and chitosan: antimicrobial efficacy against Salmonella cocktail, *by Sudarshan Reddy Medagam, North Carolina State University, USA*
19. Solubility of menthol in supercritical CO2 + co-solvents and its extraction from Mentha × piperita, *by Yuan Meng, University of Alberta, Canada*
20. Waterless Plasma Treatment for the Safety of Shell Eggs, *by Deepti Salvi, North Carolina State University, USA*
21. Hyperbaric storage – a new food preservation methodology to control the development of Clostridium perfringens endospores at room temperature, *by Carlos Pinto, University of Aveiro, Portugal*
22. Growth of fungi pellets in wastewater for biomass and biosolids recovery, *by Ana Beatriz Lobo-Moreira, University of Minnesota, USA*
23. High Pressure Processing (HPP) of pulse proteins: Effects of acidification and calcium addition on protein structure and functionality, *by April Huang, Cornell University, USA*
24. Cold Plasma Modification of Nanocellulose Crystals: Advancing Sustainable Biodegradable Films, *by Azin Farmanfarmaee, The University of Georgia, USA*
25. Ex-ante life-cycle assessment (LCA) and cost comparison among non-thermal food technologies, *by Minliang Yang, North Carolina State University, USA*
26. Characterization of astaxanthin nanoemulsions produced by intense fluid shear through a self-throttling valve-based UltraShear high pressure homogenizer*, by Alexander Lazarev, Pressure BioSciences, Inc., USA*

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Food Science and Technology

INVITATION TO CONTRIBUTE

SPECIAL ISSUE ON

2023 IFT-EFFOST INTERNATIONAL NONTHERMAL PROCESSING WORKSHOP

GUEST EDITORS: GUSTAVO V BARBOSA-CÁNOVAS, OLIVER SCHLUTER, PAUL CHEN,

INDRAWATI OEY, MARLENY D.A. SALDAÑA, AND ROGER RUAN

Food Science and Technology and IFT-EFFoST are pleased to announce a special issue on "2023 IFT-EFFoST International Nonthermal Processing Workshop", to be published in 2024. We encourage all presenters at the workshop to submit their papers for consideration in this special issue.

We are particularly interested in contributions that highlight various nonthermal processing topics related to the following:

- Nonthermal food and bioprocessing for the circular economy
- Sustainable nonthermal food processing
- Innovations in food safety through nonthermal processing technologies
- Enhancing nutrition, quality, and health through nonthermal processing
- Implementing nonthermal processing technologies in industrial practice (industrial case studies)
- Nonthermal process development, validation, and regulatory aspects

For more information about the conference topics, please visit
https://biorefining.cfans.umn.edu/workshop-and-short-course-topics

Both original research and critical review papers are invited.

Manuscript Preparation

Please prepare your manuscript according to the Author Guidelines available on the journal website (https://www.sciencedirect.com/journal/lwt/publish/guide-for-authors). Submit your manuscript electronically at https://www2.cloud.editorialmanager.com/lwt/default2.aspx. make sure to select the article type 'VSI: IFT-EFFoST workshop' while doing so.

LWT is an open access journal and your submission will receive a discount of 30% on the article publishing charges.

Timeline

The journal will begin accepting manuscripts for the special issue between November 1, 2023, and March 31, 2024. All submitted manuscripts will undergo single-anonymous peer review using the journal's editorial standards before acceptance. Articles that are not selected for the special issue will be considered for publication in a regular issue.